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(54) **LOCKING DEVICE FOR A VEHICLE SEAT**

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(30) **Foreign Application Priority Data**

Aug. 11, 2001 (DE) 101 39 630

(51) **Int. Cl.**[7] **F16M 13/00**
(52) **U.S. Cl.** **248/429**; 248/430
(58) **Field of Search** 248/429, 424, 248/419, 421, 423; 297/331, 344.1, 341

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,806,825	A	*	9/1998	Couasnon	248/429
5,918,847	A	*	7/1999	Couasnon	248/430
5,951,086	A	*	9/1999	Hoshino et al.	296/65.03
6,113,051	A		9/2000	Moradell et al.	
6,123,379	A	*	9/2000	Yamada et al.	296/65.03
6,126,133	A		10/2000	Timon et al.	
6,161,892	A	*	12/2000	Chabanne et al.	296/65.03
6,227,596	B1	*	5/2001	Foucault et al.	296/65.13
6,328,272	B1	*	12/2001	Hayakawa et al.	248/429
6,513,868	B1	*	2/2003	Tame	297/341

FOREIGN PATENT DOCUMENTS

DE	42 42 895	C1	11/1993
DE	198 11 094	A1	10/1999
DE	199 18 622	A1	11/1999
EP	0 845 384	A1	6/1998
EP	0 936 102	A1	8/1999
FR	2 759 330	A1	8/1998
WO	WO 95/02520	A1	1/1995

* cited by examiner

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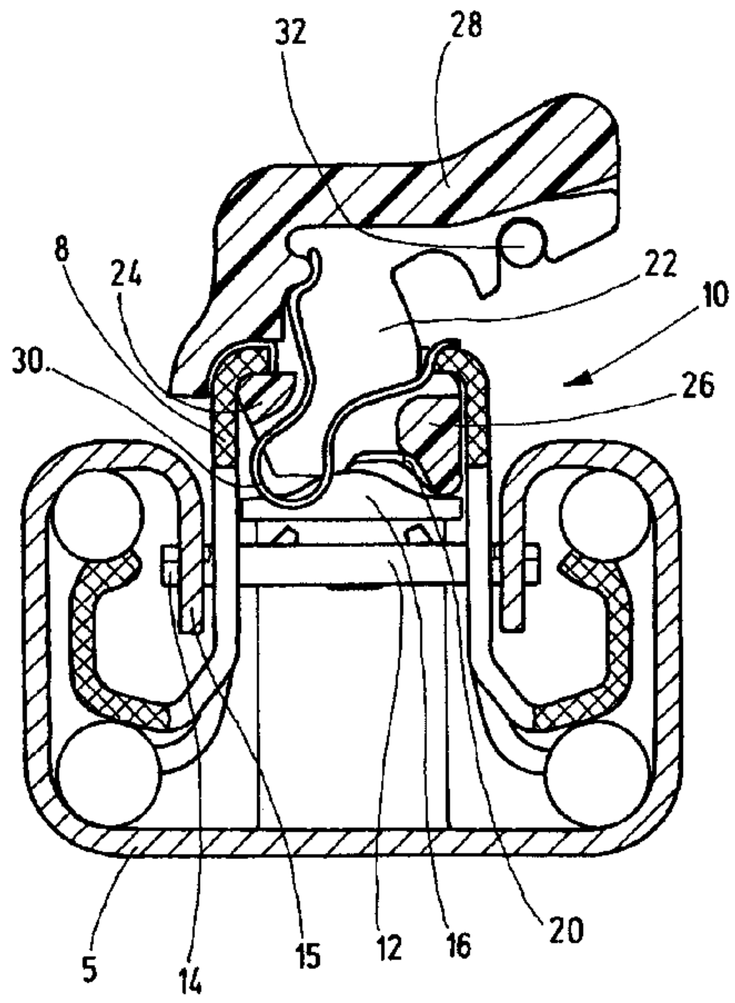
(57) **ABSTRACT**

In a locking device for a vehicle seat, particularly a motor vehicle seat with a first component group **(12, 16)**, having at least one locking element **(14)** for interacting with a first seat rail **(5)**, being pretensioned and movably borne on a second seat rail **(8)**, and a second component group **(22, 28)** being movably borne relative to the first component group **(12, 16)** on the second seat rail **(8)** and acting on the first component group **(12, 16)** when acted on by a manually operated unlocking element **(34)**, and control elements **(20, 26)** for controlling the unlocking process of the first component group **(12, 16)**, the component groups **(12, 16, 22, 28)** are each rigid, and the control elements **(20, 26)** are arranged between the first component group **(12, 16)** and the second component group **(22, 28)**.

20 Claims, 2 Drawing Sheets



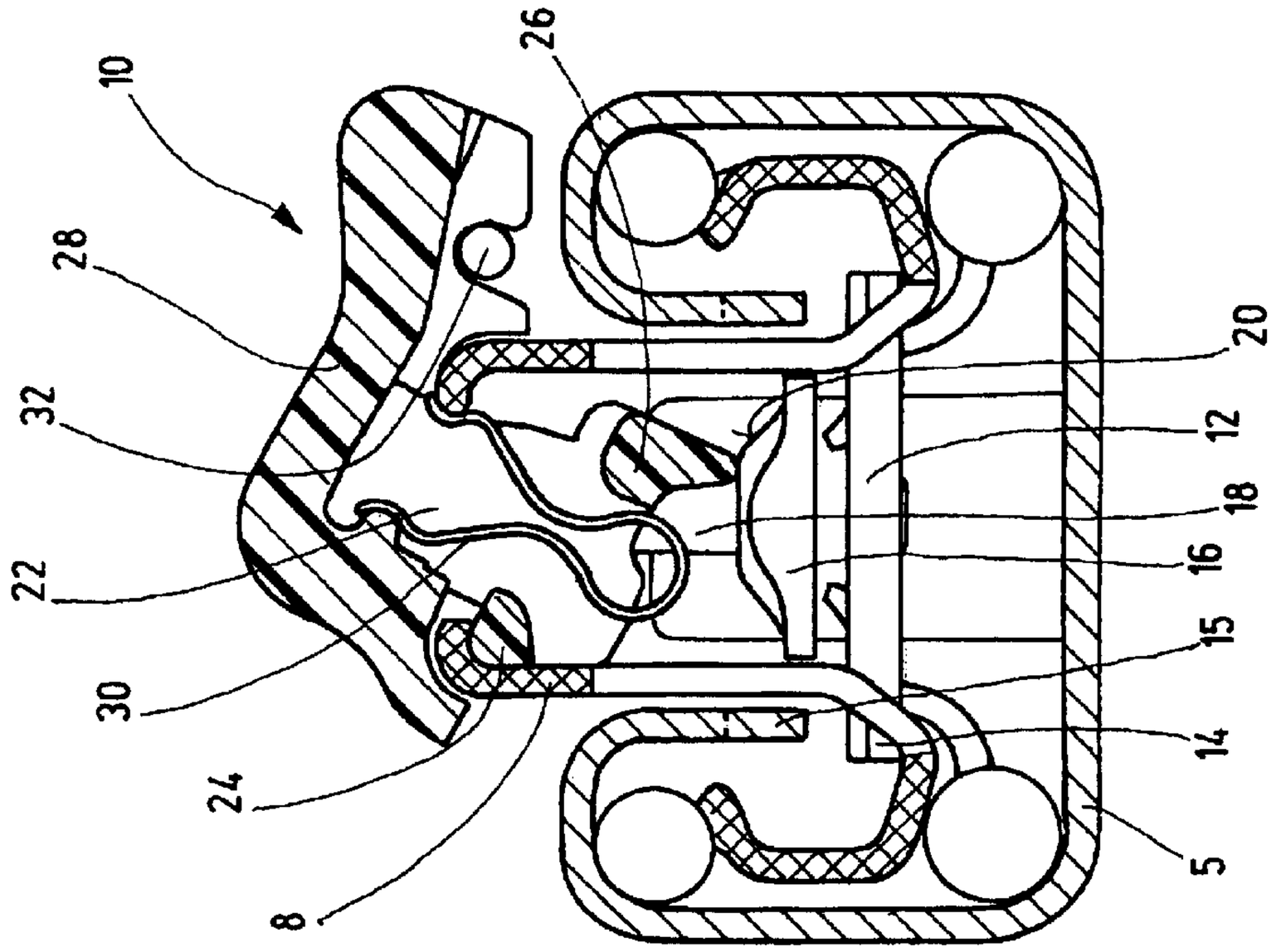

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Fig.2

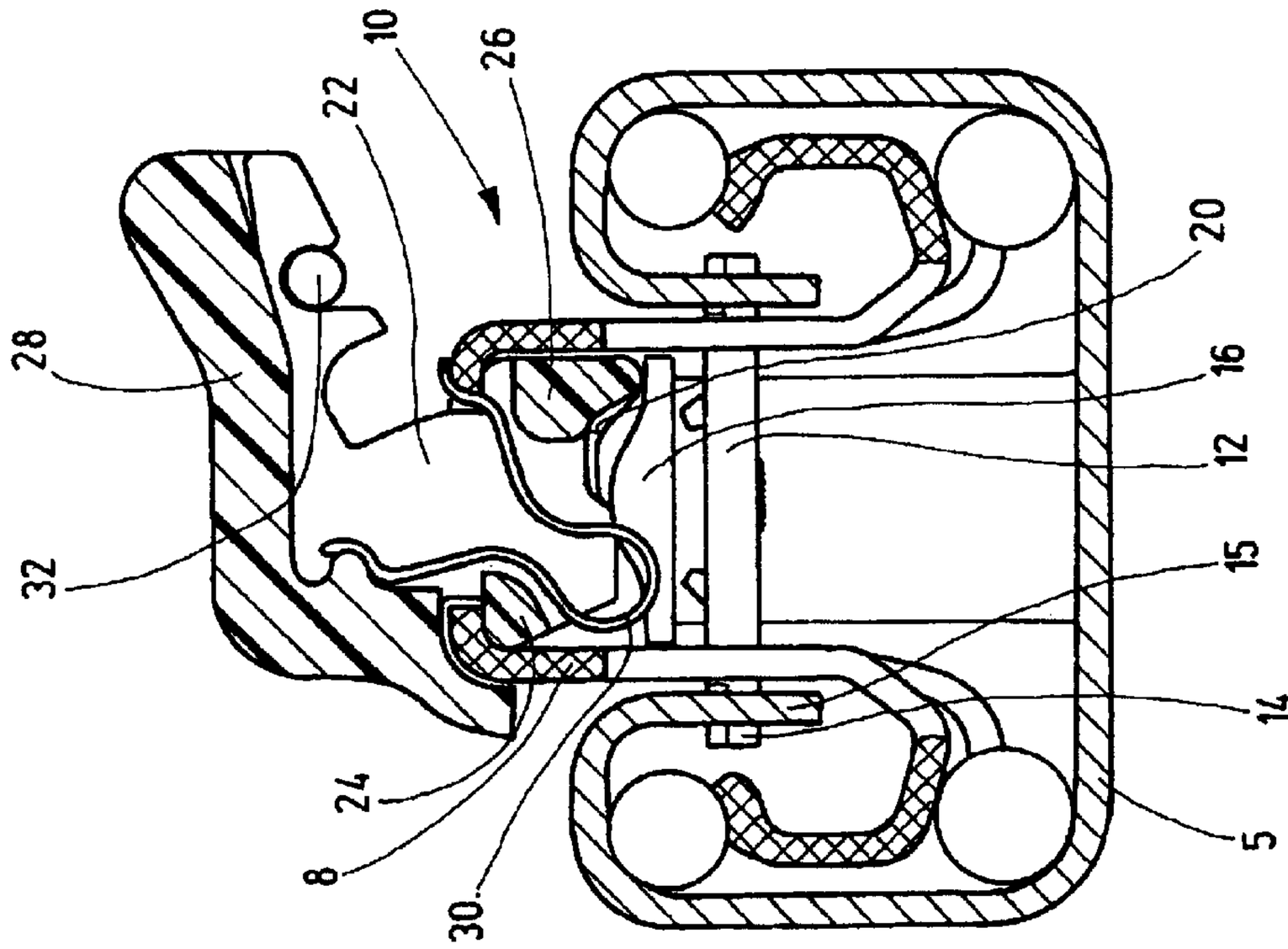
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Fig.1

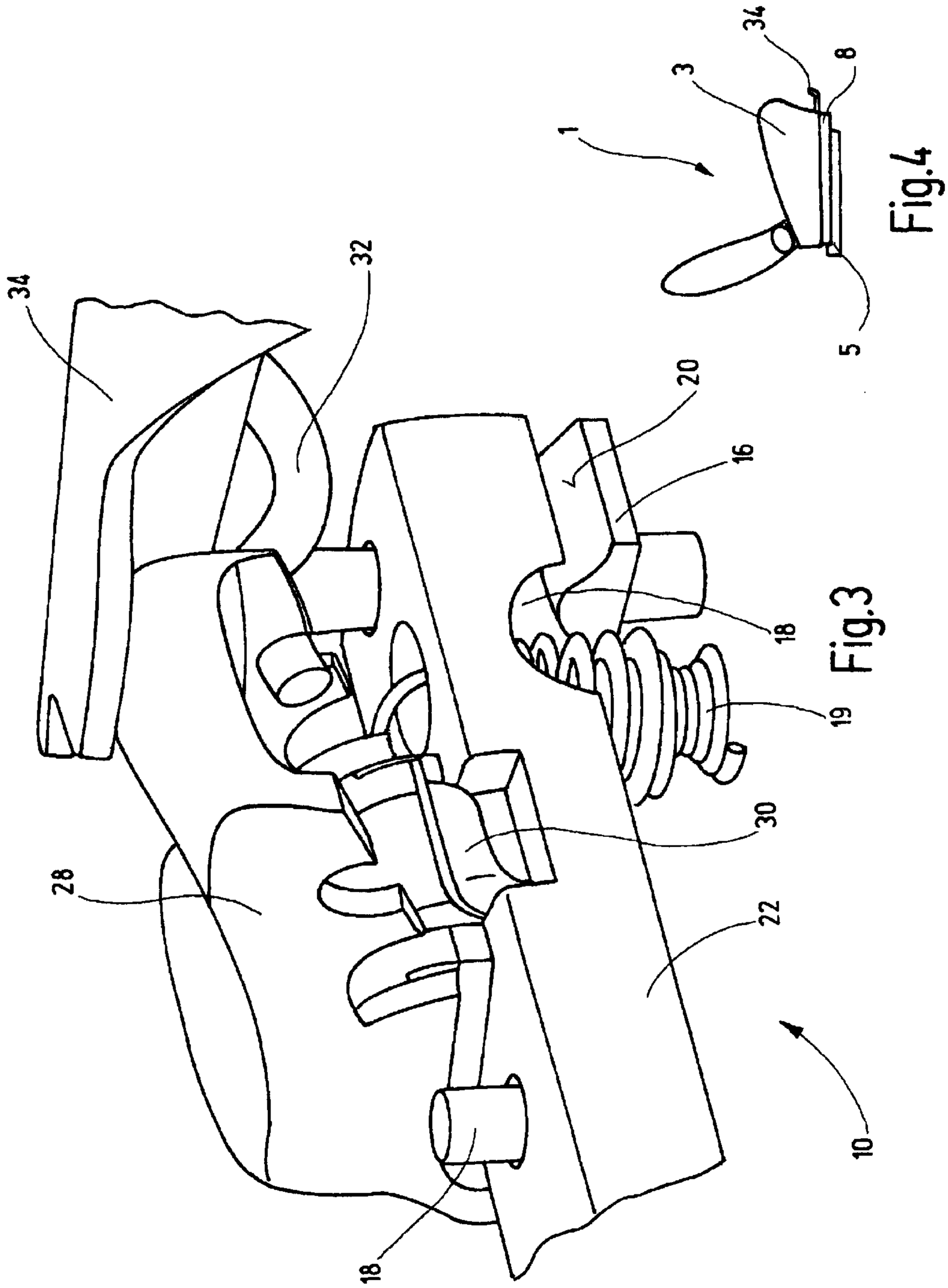

Fig.3

Fig.4

LOCKING DEVICE FOR A VEHICLE SEAT

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation of PCT/EP02/07769, which was filed Jul. 12, 2002, published in German, and is entirely incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention concerns a locking device for a vehicle seat, particularly in an adjuster for a motor vehicle seat, including a first component group having at least one latch element for interacting with a first seat rail, with the first component group being movably borne, in a pretensioned manner, on a second seat rail; a second component group borne on the second seat rail for moving relative to the first component group, with the second component group acting on the first component group in response to the second component group being acted upon by a manually operated unlocking element; with control elements for controlling the unlocking process of the first component group.

In a locking device of the type described in the immediately preceding paragraph, known from DE 198 11 094 A1, a manually operated arm acts on a lever journaled in a support bearing fixed to the upper rail, with the lever lifting spring-loaded latches from openings in the lower rail. The shape of the support bearing and the bearing edge of the lever are chosen in such a way that they act as control elements influencing the activation process, particularly controlling the magnitude of the unlocking force to be applied.

BRIEF SUMMARY OF THE INVENTION

The object of the invention is to improve a locking device of the type described in the preceding section and particularly to facilitate the activation of same at a production cost that should ideally remain the same. According to the invention this object is achieved by a locking device for a vehicle seat, particularly a motor vehicle seat, with a rigid first component group including at least one latch element, wherein the first component group is borne by a first seat rail for moving relative to the first seat rail between locked and unlocked positions, with the latch element interacting with a second seat rail to restrict relative movement between the first and second seat rails while the first component group is in the locked position, the latch element allowing the relative movement between first and second seat rails while the first component group is in the unlocked position, and the first component group being biased toward the locked position; a rigid second component group borne by the second seat rail for moving relative to and acting upon the first component group in response to the second component group being acted upon by a manually movable unlocking element; control elements between the first and second component groups cause the first component group to move in a predetermined, controlled manner from the locked position to the unlocked position in response to the second component group acting upon the first component group.

By arranging the control elements between the first component group and the second component group, the function for controlling the unlocking force is separate from the bearing function. With a view to the different applications, the shape of the control elements can be more varied, particularly in order to reduce the overall required activation force and to influence its time course, without having to take the bearing function into account. Because the component groups are each rigid, no additional components are necessary for the interplay of component groups and control elements, these additional components being likely to increase the production costs and the total play.

The preferably pivotable second component group is preferably borne inside a mounting space defined by the second seat rail and is preferably pretensioned with respect to the second seat rail. As compared to the known bearing option outside the second seat rail, this requires less mounting space outside of it. The control element for interacting with the first component group is then also preferably arranged inside this mounting space at a distance from the bearing, whereas the component of the second component group interacting with the unlocking element is arranged outside the mounting space. The second component group can be made entirely of plastic, so that it is easy to manufacture even in a more complex version. Then, the second component group can be a monoblock or can be made of different parts which are connected with one another.

Preferably, the first component group has a sliding curve forming the control element, the sliding curve having different levels of depth extending in the direction of movement of the first component group, for example flatter or steeper sections. The force required for unlocking then depends on the shape of the sliding curve and the distance between the contact point of the second component group on this sliding curve and the bearing of the second component group.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in greater detail with reference to an exemplary embodiment illustrated in the drawings, in which:

FIG. **1** is a section through the exemplary embodiment in a locked state,

FIG. **2** is a section through the exemplary embodiment in an unlocked state,

FIG. **3** is a partial perspective view of the second component group and several components that are in contact with same, and

FIG. **4** is a schematic representation of a vehicle seat.

DETAILED DESCRIPTION OF THE INVENTION

A longitudinally adjustable vehicle seat **1** with a seat part **3** has one pair of seat rails on each side serving as a longitudinal adjuster. Each of the pairs consists of a lower rail **5** that is fixed to the vehicle structure and functions as a guide rail, and an upper rail **8** that is fixed to the seat part **3** and functions as a runner rail that slides in the lower rail. The lower rail **5** and the upper rail **8** are both constructed in a generally U-shaped manner and grip each other with their edges which are bent inward and outward, respectively. The seat rails also define the directional references used below.

A locking device **10** has three steel detent plates **12** which are horizontally arranged inside a mounting space defined by the upper rail **8**. The detent plates **12** have on each side three teeth **14** protruding through openings in the side sections of the upper rail **8**. To lock the upper rail **8** with the lower rail **5**, the teeth **14** interact with U-shaped fixtures **15** opening downward and formed in the edges of the lower rail **5** which are bent inward. A push element **16** having a vertical steel guide bolt **18** is formed onto the upper side of each detent plate **12**, or is firmly attached to it, being made of steel or

plastic. The detent plate **12** is pretensioned in an upward direction towards the upper rail **8** by way of a spring **19** and is guided by way of the guide bolt **18** in the middle section of the upper rail **8** that is arranged at the top. This middle section also defines the upper side of the upper rail **8**. Each detent plate **12** with its teeth **14** and the push element **16** forms a first component group that is rigid. In the locked state of the locking device **10**, the detent plates **12** grip the lower rail **5**, so that the seat rails cannot slide relative to one another.

On its upward-facing side, around the guide bolt **18**, the push element **16** has a sliding curve **20** which has different depths with respect to the direction of movement of the push element **16** as defined by the guide bolts **18**. A rotational transverse bar **22** made of plastic is arranged partially inside and partially above the mounting space defined by the upper rail **8**, protruding through openings in the middle section of the upper rail **8**. The rotational transverse bar **22** is borne in an upper corner area of the upper rail **8** by way of a bearing flange **24** formed on it and arranged along the upper rail **8** inside a mounting space defined by the upper rail **8**. On the side opposite the bearing flange **24**, with the rotational transverse bar comprises a control flange **26** extending in the longitudinal direction defined by the upper rail **8**.

A pressure arm **28** made of plastic is fixedly attached to the rotational transverse bar **22**, another option being that the pressure arm **28** would form one piece with the rotational transverse bar **22**. The rotational transverse bar **22** and the pressure arm **28** form a second component group that is rigid. The pressure arm **28** is pretensioned by way of an arm spring **30** with respect to the upper rail **8**, and by way of a torsion spring **32** loaded in an upward direction with respect to a seat part structure fixed transverse bar, i.e. the control flange **26**, in a locked position of the locking device **10**, is in the upper corner section of the upper rail **8** opposite the control flange **24**, with the control flange **26** bearing against a lateral section of the sliding curve **20**. An unlocking arm **34** having the function of an unlocking element is borne in a seat part structure fixed bearing. The unlocking arm **34** rests on the push arm **28** with a short lever, being arranged, for example, in the front section of the seat part **3** in a way that it can be reached by the user.

For unlocking, the unlocking arm **34** is manually pulled upward, thereby pressing the push arm **28** downward in such a way that the control flange **26** is moved downward. First, the control flange **26** slides over an ascending, steeper section of the respective sliding curves **20** of the detent plates **12**, which may be arranged with different depths. By choosing the proper shape of the sliding curve **20**, the force increase can be kept at a minimum. As soon as the respective detent plate **12** has been lifted out of its slots **15**, i.e. has been pushed downward, away from the lower rail **5**, the unlocking point is reached. Behind the unlocking point, the gradient of the sliding curve **20** decreases in a flat middle section, i.e. the transmission ratio decreases, with the result that less force will need to be applied by the user for unlocking.

That which is claimed:

1. A locking device for a vehicle seat, comprising:

a rigid first component group including at least one latch element, wherein the first component group is borne by a first seat rail for moving relative to the first seat rail between locked and unlocked positions, with the latch element interacting with a second seat rail to restrict relative movement between the first and second seat rails while the first component group is in the locked position, the latch element allowing the relative movement between first and second seat rails while the first component group is in the unlocked position, and the first component group being biased toward the locked position; a rigid second component group borne by the second seat rail for moving relative to and acting upon the first component group in response to the second component group being acted upon by a manually movable unlocking element; control elements between the first and second component groups for causing the first component group to move in a predetermined, controlled manner from the locked position to the unlocked position in response to the second component group acting upon the first component group; wherein the second component group is pivotably borne on the second seat rail by way of a bearing, and wherein said bearing is located inside a mounting space defined by the second seat rail.

2. A locking device according to claim **1**, wherein the second component group includes a control element of said control elements, and the control element of the second component group is a control flange that is located inside the mounting space defined by the second seat rail and is distant from said bearing.

3. A locking device according to claim **1**, wherein the second component group includes a transverse bar that is borne by the second seat rail for rotating relative to the second seat rail, wherein a portion of the transverse bar is positioned in the mounting space defined by the second seat rail and another portion of the transverse bar is positioned outside of the mounting space defined by the second seat rail.

4. A locking device according to claim **1**, wherein the second component group is pretensioned with respect to the second seat rail.

5. A locking device according to claim **1**, wherein the second component group is made of plastic and is a monoblock or is made of several components.

6. A locking device according to claim **1**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first component group includes a control element of said control elements, and the control element of the first component group is a sliding curve having different depths in said direction.

7. A locking device according to claim **6**, wherein the sliding curve has flatter and steeper sections.

8. A locking device according to claim **1**, wherein the locking device is in combination with the vehicle seat which is longitudinally adjustable.

9. A locking device according to claim **6**, wherein the second component group includes a control element of said control elements, the control element of the second component group is a control flange that slides across the sliding curve to cause the first component group to move in the predetermined, controlled manner from the locked position to the unlocked position.

10. A locking device according to claim **2**, wherein the second component group includes a transverse bar that is mounted for rotating relative to the second seat rail, wherein a portion of the transverse bar is positioned in the mounting space defined by the second seat rail and another portion of the transverse bar is positioned outside of the mounting space defined by the second seat rail.

11. A locking device according to claim **1**, wherein the second component group is made of plastic.

12. A locking device according to claim **2**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first

component group includes a control element of said control elements, and the control element of the first component group is a sliding curve having different depths in said direction, and wherein the control flange slides across the sliding curve to cause the first component group to move in the predetermined, controlled manner from the locked position to the unlocked position.

13. A locking device according to claim **3**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first component group includes a control element of said control elements, and the control element of the first component group is a sliding curve having different depths in said direction.

14. A locking device according to claim **4**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first component group includes a control element of said control elements, and the control element of the first component group is a sliding curve having different depths in said direction.

15. A locking device according to claim **5**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first component group includes a control element of said control elements, and the control element of the first component group is a sliding curve having different depths in said direction.

16. A locking device for a vehicle seat, comprising:

a rigid first component group including at least one latch element, wherein the first component group is mounted to a first seat rail for moving relative to the first seat rail between locked and unlocked positions, with the latch element interacting with a second seat rail to restrict relative movement between the first and second seat rails while the first component group is in the locked position, the latch element allowing the relative movement between first and second seat rails while the first component group is in the unlocked position, and the first component group being biased toward the locked position; a rigid second component group including a bearing located inside a mounting space defined by the second seat rail so that the second component group is pivotably borne on the second seat rail for pivoting relative to the first component group and acting upon the first component group; control elements between the first and second component groups for causing the first component group to move in a predetermined, controlled manner from the locked position to the unlocked position in response to the second component group acting upon the first component group.

17. A locking device according to claim **16**, wherein the movement of the first component group from the locked position to the unlocked position is in a direction, the first component group includes a control element of said control elements, the control element of the first component group is a sliding curve having different depths in said direction, the second component group includes a control element of said control elements, the control element of the second component group is a control flange that slides across the sliding curve to cause the first component group to move in the predetermined, controlled manner from the locked position to the unlocked position.

18. A locking device for a vehicle seat, comprising:

a rigid first component group including at least one latch element, wherein the first component group is mounted to a first seat rail for moving relative to the first seat rail between locked and unlocked positions, with the latch element interacting with a second seat rail to restrict relative movement between the first and second seat rails while the first component group is in the locked position, the latch element allowing the relative movement between first and second seat rails while the first component group is in the unlocked position, and the first component group being biased toward the locked position; and

a rigid second component group including a bearing located inside a mounting space defined by the second seat rail so that the second component group is pivotably borne on the second seat rail for pivoting relative to the first component group so that a surface of the second component group slides across a surface of the first component group to cause the first component group to move in a predetermined, controlled manner from the locked position to the unlocked position.

19. A locking device according to claim **1**, wherein:

the first component group includes:

a detent plate which includes the latch element and moves with the first component group relative to the first seat rail between the locked and unlocked positions, and

a pushable element which is connected to the detent plate and moves with the first component group relative to the first seat rail between the locked and unlocked positions;

the second component group includes:

a transverse bar that is borne by the second seat rail for rotating relative to the second seat rail, wherein a portion of the transverse bar is positioned in the mounting space defined by the second seat rail and another portion of the transverse bar is positioned outside of the mounting space defined by the second seat rail, and

an arm which extends from the transverse bar and is for being moved to cause the transverse bar to rotate relative to the second sear rail;

said bearing is part of the transverse bar;

the transverse bar includes a control element of said control elements, and the control element of the transverse bar is a control flange that is located inside the mounting space defined by the second seat rail and is distant from said bearing;

the movement of the first component group from the locked position to the unlocked position is in a direction;

the pushable element includes a control element of said control elements, and the control element of the pushable element is a sliding curve having different depths in said direction; and

the control flange and the sliding curve are arranged so that rotating of the transverse bar relative to the second seat rail causes the control flange to slide across the sliding curve, which causes the first component group to move in the predetermined, controlled manner from the locked position to the unlocked position.

20. A locking device according to claim **18**, wherein:

the first component group includes:

a plate which includes the latch element and moves with the first component group relative to the first seat rail between the locked and unlocked positions, and

a pushable element which is connected to the plate and moves with the first component group relative to the first seat rail between the locked and unlocked positions;

the second component group includes:

a bar that is borne by the second seat rail for rotating relative to the second seat rail, wherein a portion of the bar is positioned in the mounting space defined by the second seat rail and another portion of the bar is positioned outside of the mounting space defined by the second seat rail, and

an arm which extends from the bar and is for being moved to cause the bar to rotate relative to the second sear rail;

said bearing is part of the bar;

the bar includes said surface of the second component group;

the pushable element includes said surface of the first component group;

the movement of the first component group from the locked position to the unlocked position is in a direction;

said surface of the first component group has different depths in said direction; and

said surface of the first component group and said surface of the second component group are arranged so that rotating of the bar relative to the second seat rail causes said surface of the second component group to slide across said surface of the first component group, which causes the first component group to move in the predetermined, controlled manner from the locked position to the unlocked position.

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